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ARE YOUR EYES DECEIVING YOU?: THE EVIDENTIARY CRISIS REGARDING THE ADMISSIBILITY OF COMPUTER GENERATED EVIDENCE

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I. INTRODUCTION

The computer has revolutionized our way of working, thinking, living and playing.¹ It should come as no surprise that computers affect what happens in the courtroom.² Computer animation and simulation can allow attorneys to transform testimony and data³ into dynamic visual demonstrations, virtually transporting the jury to a re-enacted scene.⁴

At first blush, one might think computer generated evidence (“CGE”) should be treated like any other kind of evidence. CGE, however, warrants special care and caution because of its persuasive

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1. See Mario Borelli, Note, *The Computer as Advocate: An Approach to Computer-Generated Displays in the Courtroom*, 71 IND. L.J. 439, 439 (1996) (stating “In the 1990’s, our culture has become computer crazed.”).

2. See Declan O’Flaherty, *Computer-Generated Displays in the Courtroom: For Better or Worse?*, Blackstone Press Ltd., available at, <http://webjcli.ncl.ac.uk/1996/issue4/oflah4.html> (last visited Mar. 12, 2004) (“More recently, major advances in technology have meant that computer-generated displays have been unleashed in the courtroom”). A local example of this emersion can be seen in New York with Courtroom 228, also known as “Courtroom 2000.” Courtroom 228, located in the New York State Supreme Court, is wired for real-time transcription of trials and also includes its own IEPS, known as DEPSTM. Lawyers can reserve the courtroom in advance if they feel they will be making use of either DEPSTM or CGE. To learn more about the technological capabilities of Courtroom 228, see generally <http://www.smarttech.com/profiles/supreme.asp> (last visited Mar. 12, 2004).

3. See O’Flaherty, *supra* note 2 (“The computer takes all input data (i.e. lighting, texture and composition of materials that make up the objects) to determine what the object will look like and renders or calculates a still frame containing the image”).

4. See generally Kristin L. Fulcher, Comment, *The Jury as Witness: Forensic Computer Animation Transports Jurors to the Scene of a Crime or Automobile Accident*, 22 U. DAYTON L. REV. 55 (1996) (discussing computer reconstructions and its impact on the courtroom).

impact,⁵ its susceptibility to manipulation, and the undue reliance jurors may place on it because of their familiarity with the medium. Although courts have admitted computer animations and simulations for about 25 years,⁶ judges sometimes admit it without paying sufficient attention to the pitfalls.

Much has been written about CGE and the questions of admissibility that it raises. This note proposes to shift the emphasis.⁷ Simply stated, the findings of social science research on the effects of visual persuasion should be used in structuring and applying admission standards.

Part II briefly describes the two main forms of CGE – animations and simulations – and then discusses the evidentiary standards for admitting animations. Part III examines applicable social science and psychological research, employing the results as tools for devising more sophisticated standards for determining admissibility. Finally, Part IV proposes some general guidelines as to how CGE can be used effectively, without undue prejudice, and suggests ways to incorporate the findings set forth in Part III.

II. THE EMERGENCE OF COMPUTERS IN THE COURTROOM

A. *The Forms of CGE*

CGE takes two main forms, animations and simulations. Computer animation is a powerful method of creating a continuous series of computer-generated images or pictures.⁸ Like commercial animation, each image in the series is altered slightly frame by frame and then recorded in rapid succession in order to mimic ac-

5. See Neal Feigenson & Meghan Dunn, *New Visual Technologies in Court: Directions for Research*, 27 LAW & HUM. BEHAV. 109, 110 (2003) (“The use of these technologies, as well as newer ones such as holograms and immersive virtual environments, is almost certain to become more persuasive, as lawyers seek to employ what they believe to be the most advanced and effective means of visual persuasion and as court administrators strive to accommodate both advocates’ strategies and jurors’ expectations about how legal cases should be presented.”).

6. See *Connors v. U.S.*, 919 F.2d 1079 (5th Cir. 1991). This was the first time the government used a computer animated display to recreate the August 2, 1985 crash of Delta Airlines Flight 191.

7. O’Flaherty, *supra* note 2.

8. See O’Flaherty, *supra* note 2.

tual movement.⁹ A computer animation is a producer's version of a witness' testimony that may result in a helpful illustration of the testimony.¹⁰ Animations should not necessarily be accepted as the unquestionable truth, however, because the reliability of the animation is completely dependent upon the expert's testimony and credibility.¹¹ Animations can be used in two ways: 1) a witness on the stand can present a conclusion and use the animation to illustrate the findings, or 2) the animation may simply illustrate factual testimony.¹²

The second form of CGE is a computer simulation. In essence, with this form, the computer's data codes and resulting output become the witness.¹³ A computer simulation construction has three steps.¹⁴ First, variable sets representing the coordinates of objects present at the scene are inputted.¹⁵ Next, the information is processed and synthesized to calculate the motion of each object involved in the incident.¹⁶ Finally, the information inputted yields output in the form of a visual presentation that conforms to the laws of science and physics.¹⁷ Once a computer simulation is "verified by an expert as being scientifically sound and based on scientific knowledge and physical laws, [it] should demonstrate not what

9. See Karen D. Butera, Note, *Seeing is Believing: A Practitioners Guide to the Admissibility of Demonstrative Computer Evidence*, 46 CLEV. ST. L. REV. 511, 517 (1998).

10. See Borelli, *supra* note 1, at 20. See also James E. Carbine & Lynn McLain, *Proposed Model Rules Governing the Admissibility of Computer Generated Evidence*, 15 SANTA CLARA COMPUTER & HIGH TECH. L.J. 1, 8-9 (1999).

11. See Fred Galves, *Where the Not-So-Wild Things Are: Computers in the Courtroom, the Federal Rules of Evidence, and the Need for Institutional Reform and More Judicial Acceptance*, 13 HARV. J.L. & TECH. 172, 182 (2000).

12. See Donna Childress, *Computer Graphics May Animate Tort Cases*, 8 VA. LAWYERS WEEKLY 869 (1994); James W. Dabney, *Patent Win Attributed to 3-D Computer Imagery: Success in a Patent Infringement Lawsuit Demonstrates the Impact of Three-Dimensional Animation*, 17 NAT'L L.J., Apr. 3, 1995, at C15.

13. See Elan E. Weinreb, "Counselor Proceed with Caution": *The Use of Integrated Evidence Presentation Systems and Computer-Generated Evidence in the Courtroom*, 23 CARDOZO L. REV. 393, 404 (2001).

14. *Id.*

15. See Adam T. Berkoff, *Computer Simulations in Litigation: Are Television Generation Jurors Being Misled?*, 77 MARQ. L.REV. 829, 831 (1994).

16. *Id.*

17. See Kevin Lee Thompson, *Using Computer Generated Evidence*, at <http://www.legalimaging.com/evidence.html> (last visited Sept. 23, 2003). The final exhibit that is presented to the jury involves more than a simple straightforward image. See Berkoff, *supra* note 15, at 830.

'might' have happened or what 'could' have happened, but what *actually did happen*".¹⁸

B. *The Evidentiary Standards for Admitting Animations*

Demonstrative evidence may consist of charts, diagrams, objects or other items, including movies or computer animations, that are faithful reproductions of the object or thing being depicted.¹⁹ As will be discussed below, to be admitted, demonstrative animations must clarify or illustrate relevant events in the case or provide useful background information.²⁰ Moreover, the expert who developed the animation must testify as to its validity and accuracy.²¹ Further, both the source information and the computer processes used to create the animation are subject to judicial scrutiny for their reliability and accuracy.²²

18. See Michael Hoenig, *Computer Simulations and Other Weapons*, 3 N.Y.L.J., Mar. 8, 1993, at 3. The primary difference between the two evidentiary forms is that a simulation can be outcome determinative; the simulation has reached a conclusion on how the event occurred and provides that conclusion at trial. Quite obviously, simulations are a more forceful form of CGE as it can present concrete proof as well as perform the illustrative functions of an animation. The visual force of today's simulations allow counsel to show jurors dynamic processes that were previously impossible to depict and equally difficult to understand with verbal testimony alone. See also Weinreb, *supra* note 13, at 405; Ronald J. Rychlak, *REAL AND DEMONSTRATIVE EVIDENCE: APPLICATIONS AND THEORY* (The Michie Company 1995). (emphasis added).

19. See Butera, *supra* note 9, at 513-16; See also Richard M. Dunn & Christopher D. Brown, *Getting on the Bus: Some Suggestions on Admitting Computer Graphics into Evidence at Trial*, 65 DEF. COUNS. J. 526, October, 1998; ASHLEY S. LIPSON, *ART OF ADVOCACY: DEMONSTRATIVE EVIDENCE* § 2.06[1] (1989).

20. See Elaine Chaney, Note, *Computer Simulations: How They Can Be Used at Trial and the Arguments for Admissibility*, 19 IND. L. REV. 735, 741 (1986).

21. See text and accompanying footnotes *infra* Part II.B.

22. See Butera, *supra* note 9, at 522 ("In addition to the substantive expert [being found qualified], the demonstrative computer simulation may require the testimony of the expert who actually produced the simulation."). See also Robert M. Pozin, *Computer Evidence Part II: Sophisticated Models and In-Court Demonstrations*, 15 SPG. BRIEF 43, 45 (1986). To establish a foundation for admission of demonstrative evidence, the following requirements must be met: 1) the demonstrative exhibit relates to other relevant, competent, and material testimonial, documentary, or real evidence; 2) the witness whose testimony the demonstrative exhibit illustrates is familiar with the exhibit; 3) the demonstrative evidence fairly and accurately reflects the other evidence to which it relates; and 4) the demonstrative evidence will aid the trier of fact in understanding or evaluating the other related evidence. The demonstrative evidence must meet all other general evidentiary rules that apply to evidences of all forms.

There are two main advantages to using an animation as demonstrative evidence rather than evidence itself. First, the evidentiary requirements are less stringent than those required for scientific evidence. Second, the trial judge is granted broad discretion in deciding whether to allow witnesses to supplant their testimony with a demonstrative aid.²³ The desire to provide the jury with the best possible understanding of testimony, coupled with the trial court's preference for straightforward explanations, increases the probability that demonstrative evidence will be found probative.²⁴ The primary downside of using animations solely for demonstrative purposes is that the jury may view the animation *only* when the expert testifying uses the animation to illustrate their testimony. In that situation, the animation may not be received into evidence and later viewed by the jury during deliberations.²⁵

For an animation to be admitted, Rule 901 of the Federal Rules of Evidence and the common law test of "substantial similarity" must be met. All evidence must meet the minimum authentication requirements of Rules 901(a) and 901(b)(9). Rule 901(a) requires the production of evidence sufficient to support a finding that the evidence is what it purports to be.²⁶ Rule 901(b)(9) explains that FRE 901(a) is met by establishing the reliability of the system used to create the animation and by establishing the accuracy of the system's output.²⁷

To lay the proper foundation for admission of an animation, the testifying witness must state that the CGE portrays the disputed subject matter fairly and accurately.²⁸ Moreover, the CGE must be

23. See Dunn & Brown, *supra* note 19.

24. See Chaney, *supra* note 20, at 742. See also Vicki S. Menard, Comment, *Admission of Computer Generated Evidence: Should There Be Clear Standards?*, 6 SOFTWARE L.J. 325, 334-35 (1993); MARK A. DOMBROFF, DOMBROFF ON DEMONSTRATIVE EVIDENCE § 1.15 (1983).

25. See Dunn & Brown, *supra* note 19, at 528.

26. FED. R. EVID. 901(a) "The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims."

27. FED. R. EVID. 901(b)(9) "Process or system. Evidence describing a process or system used to produce a result and showing that the process or system produces an accurate result."

28. See *e.g.*, Cleveland v. Bryant, 512 S.E.2d 360, 362 (Ga. Ct. App. 1999) ("A computer-generated animation is admissible if it is a fair and accurate representation of the scene sought to be depicted."); United States v. Wanoskia, 800 F.2d 235 (10th Cir.

“substantially similar” to the event it is portraying.²⁹ This standard dictates that where “an experiment purports to simulate actual events and to show the jury what presumably occurred at the scene of the accident, the party introducing the evidence has a burden of demonstrating substantial similarity of conditions.”³⁰ Although the animation and the actual event do not have to be identical, an animation will not be admitted unless the test conditions are “so nearly the same in substantial particulars [as those involved in the episode in litigation] as to afford a fair comparison in respect to the particular issue to which the test is directed.”³¹ In general, because “perfect identity between experimental or actual conditions is neither attainable nor required. . . . [dissimilarities affect [only] the weight of the evidence, not admissibility.”³² A close “matchup of condi-

1986) (stating, “. . . a court must take special care to ensure that the demonstration fairly depicts the events at issue. [This is because] demonstrative evidence, and in particular, reenactments of events, can be highly persuasive. The opportunity for the jury to see what supposedly happened can accomplish in seconds what might otherwise take days of testimony.”); *see also* EDWARD CLEARY *et al.*, MCCORMICK ON EVIDENCE, §215 (3d ed. 1984) (stating, “[b]y conveying a visual image of what allegedly occurred, one side can imprint on the jury’s mind its version of the facts.”).

29. *See e.g.*, *Clark v. Cantrell*, 504 S.E.2d 605, 612 (S.C. Ct. App. 1998), *aff’d as modified*, 529 S.E.2d 528 (S.C. 2000) (“Animated evidence [to be admitted, must] mirror the actual facts of the case and [support] relevant testimony.”); *see also* *Kehm v. Proctor & Gamble Mfg. Co.*, 724 F.2d 613 (8th Cir. 1983) (permitting an expert to testify to the differences between experimental conditions and the actual vaginal environment to allow the jury to determine the significance of experimental results in a product liability action against a tampon manufacturer).

30. *Jackson v. Fletcher*, 647 F.2d 1020, 1027 (10th Cir. 1981) (establishing a strict threshold requirement for the admission of experimental and/or demonstrative evidence). *See also* *Randall v. Warnaco, Inc. Hirsch-Weis Div.*, 677 F.2d 1226, 1234 n.7 (8th Cir. 1982) (stating that the admission of experimental evidence “very close to a reenactment of the accident . . . could be deemed unduly prejudicial”); *United States v. Hart*, 729 F.2d 662, 669 (10th Cir. 1984) (excluding admission of a demonstrative hairpin absent evidence that it was comparable to a hairpin actually used to open a lock).

31. *Illinois Central Gulf R.R. v. Ishee*, 317 So.2d 923, 926 (Miss. 1975), *cited with approval in* *Barnes v. General Motor Corp.*, 547 F.2d 275, 277 (5th Cir. 1977).

32. *Ramseyer v. General Motors Corp.*, 417 F.2d 859, 864 (8th Cir. 1969) (“Admissibility of evidence depends upon the foundational showing of substantial similarity between the tests conducted and actual conditions. The decision whether to admit or exclude evidence of experiments in a particular case rests largely in the discretion of the trial judge and his discretion will not be overturned on appeal absent a clear showing of an abuse of discretion.”).

tions" is deemed sufficient to allow the animation to be presented to the jury.³³

Each case must be judged on its own facts, taking into account the specific purposes for which the animation is submitted.³⁴ The trial judge has broad leeway in making this determination; a ruling will not be upset unless it is clearly erroneous.³⁵ Broad discretion in applying such a vague standard may cause problems if a judge lacks the expertise to evaluate a sophisticated animation.³⁶ The party opposing admission may challenge the animation by pointing out differences between the animation and actual conditions that might undercut the animation's probity.³⁷

Additionally, a computer expert qualified under FRE 702³⁸ must certify the validity, reliability and accuracy of the source of information, the computer process and the results.³⁹ This can be done by showing that (1) the computer equipment is accepted in the field as competent and was in good working order; (2) qualified computer operators were employed; (3) proper procedures were followed regarding the input and output of information; (4) a reliable software program was used; (5) the equipment functioned correctly; and (6) the exhibit being employed identified the output shown to the jury.⁴⁰

Under FRE 702, expert testimony is allowed "in the form of an opinion *or otherwise*" if the trier of fact is potentially helped by such testimony.⁴¹ The "or otherwise" is implicated when animations are

33. Robbins v. Whelan, 653 F.2d 47 (1981), *cert. denied*, 454 U.S. 1123 (1981).

34. *Id.*

35. Hall v. General Motors Corp., 647 F.2d 175 (D.C. Cir. 1980).

36. The discretion of the trial court is generally sustained despite minor variations in conditions. *See, e.g.,* Four Corners Helicopters, Inc. v. Turbomeca, S.A., 979 F.2d 1434 (10th Cir. 1992) (discussing the effect of loose screws on turbine helicopter engine; exclusion in court's discretion); Larson v. Meyer, 161 N.W.2d 165 (N.D. 1968) (allowing different equipment at a different location to illustrate capacity of a tractor to pull a similar load without overturning). *But see* Jackson v. Fletcher, 647 F.2d 1020, 1020 (10th Cir. 1981) (holding that an experiment to prove a truck had stopped at intersection with weight, engine power and different skid marks was an abuse of discretion).

37. Jackson v. Fletcher, 647 F.2d 1020, 1020 (10th Cir. 1981).

38. *See infra* notes 41-43 and accompanying text.

39. *See* Weinreb, *supra* note 13, at 410.

40. *Id.*

41. FED. R. EVID. 702 (emphasis added). "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a

offered.⁴² Because demonstrative evidence is offered for limited purposes, FRE 702 should only be applied to the underlying testimony that forms the basis of the expert's opinion and not to the science used to create the animation.⁴³

III. HOW SOCIAL SCIENCE STUDIES CAN HELP COURTS UNDERSTAND THE POTENTIAL DANGERS OF ANIMATION

Computer animated displays can captivate a jury while simultaneously making intricate, technical issues understandable.⁴⁴ Computer animations can convey the advocate's message with realism and unrelenting power.⁴⁵ A lay jury, however, may be misled by forceful visual reconstructions of complex events.⁴⁶ The vague admission standards for demonstrative evidence may also cause problems for the proponent of the CGE because the proponent may not know precisely how to satisfy the foundation require-

fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case." *Id.*

42. See Galves, *supra* note 11, at 256-60.

43. *Id.* See also Marc A. Ellenbogen, Note, *Lights, Camera, Action: Computer-Animated Evidence Gets Its Day In Court*, 34 B.C. L. REV. 1087, 1107-08 (1993); Berkoff, *supra* note 15, at 840-43.

Finally, FED. R. EVID. 705 is worth noting. This rule allows an expert to testify through opinions or inferences without testifying to the underlying data so long as the court does not require such data. This information may, however, be required to be disclosed on cross-examination. Thus, if only one party has access to animations, the validity of such evidence will be questioned in the presence of the jury. See Berkoff, *supra* note 15, at 842; see also Alan Aldous, Note, *Disclosure of Expert Computer Simulations*, 8 COMPUTER L.J. 51, 52 (1987).

44. See Wesley R. Iverson, *Animation Takes the Stand; Judging the Effectiveness of Computer Animations in the Courtroom*, COMPUTER GRAPHICS WORLD, Nov. 1991, at 48; Robert F. Seltzer, *Computer Animated Evidence Has its Day in Court*, MICH. LAW. WEEKLY, Apr. 20, 1992, at S2; see also Menard, *supra* note 24, at 327.

45. See Weinreb, *supra* note 13, at 395 (stating, "However, once computer technology is used either for presentation of evidence or as actual evidence in visual format, it leaves an impression upon a person's mind that cannot easily be erased. Moreover, that impression is likely to be perceived as one of truth. Both judges and jurors more easily give credibility to televised information. If Peter Jennings says it happened, it happened.").

46. See Saul M. Kassir & Meghan A. Dunn, *Computer-Animated Displays and the Jury: Facilitative and Prejudicial Effects*, 21 LAW & HUM. BEHAV. 269 (1997).

ments.⁴⁷ With CGE becoming the common medium for evidentiary displays, all courts should apply admission standards with a clear understanding of the sophisticated nature of CGE. Social science studies that discuss the psychological effects of such displays can assist in this process.⁴⁸

A. *The Work of Saul M. Kassin and Meghan A. Dunn*

In 1997, research by Kassin and Dunn provided the first systematic attempt to examine the effect of computer-generated displays on juries.⁴⁹ Their research was based on earlier work that suggested computer constructions of past events would likely be highly persuasive to a jury.⁵⁰

First, psychological research (in non-legal contexts) shows that most people are poor intuitive physicists and know little about the basic laws of motion.⁵¹ Consequently, jurors should be quick to believe and place great weight on a computer generated display that makes this information accessible, understandable and non-intimidating.⁵²

Second, people are strongly influenced by information that is vivid, easy to imagine, and readily available in memory.⁵³ When

47. See Menard, *supra* note 24, at 344 ("Consistency not only makes it easier for judges to rule on admissibility, but also provides proponents of computer simulations with effective standards when preparing such evidence for admission.").

48. See Kassin & Dunn, *supra* note 46, at 280 ("Serious questions being raised about their [computer animations] impact in court, the policy implications of such future studies [studies based on the psychology of juror deliberations] may well prove significant.").

49. *Id.* at 271-74.

50. *Id.* at 270.

51. *Id.* See also A. Caramazza *et al.*, *Naïve Beliefs in "Sophisticated" Subjects: Misconceptions About Trajectories of Objects*, 9 COGNITION 117, 117-23 (1981); M. McCloskey, *Naïve theories of motion*, in D. Gentner & A.L. Stevens eds., *MENTAL MODELS* (1983).

52. See Linda C. Morell, *New Technology: Experimental Research on the Influence of Computer Animated Displays on Jurors*, 28 SW. U. L. REV. 411, 414 (1999) (stating, "This finding also supports previous research that established animation makes cognitive tasks more concrete by supplying visual motion to coincide with verbal cues. Providing the animation with verbal narration reduces the processing demands on listeners' short-term memory and maximizes the likelihood of their successful and accurate encoding into long-term memory."); see also L.P. Reiber & A.S. Kini, *Theoretical Foundations of Instructional Applications of Computer-Generated Animated Visuals*, 18 J. COMPUTER-BASED INSTRUCTION 83, 83-88 (1991).

53. Kassin & Dunn, *supra* note 46, at 270; see also Brad E. Bell & Elizabeth F. Loftus, *Vivid Persuasion in the courtroom*, 49 J. PERSONALITY & SOCIAL PSYCH. 654, 654-59

mental simulation occurs⁵⁴ (exactly the procedure followed when observing a CGE), the imagined events, when recalled later, seem both probable and subjectively more likely to occur.⁵⁵

Kassin and Dunn relied on Pennington and Hastie's Story Model ("SM") as a foundation for the proposition that CGE could be persuasive in the courtroom.⁵⁶ The SM explicitly concerns the mental mechanics of juror decision-making.⁵⁷ According to the model, jurors actively organize the various strands of evidence and later use common sense to construct a persuasive story of the events in dispute.⁵⁸ This finding suggests that CGE, as compared to oral testimony, may have a powerful effect on jurors by bringing to life a visual version of the event.⁵⁹

Kassin and Dunn tested both the facilitative and prejudicial effects of computer generated displays.⁶⁰ When examined together,

(1985); Kassin *et al.*, *Blood and Guts: General and Trial-Specific Effects of Videotaped Crime Scenes on Mock Jurors*, 21 J. APPLIED SOCIAL PSYCH. 1459 (1991); Reyes *et al.*, *Judgmental Biases Resulting from Differing Availabilities of Arguments*, 39 J. PERSONALITY & SOCIAL PSYCH. 2, 2-12 (1980).

54. Mental simulation is a process where people are prompted to imagine a specific occurrence of events.

55. See W.L. Gregory *et al.*, *Self-Relevant Scenarios as Mediators of Estimates and Compliance: Does Imaging Make It So?*, 43 J. PERSONALITY & SOCIAL PSYCH. 89, 89-99 (1982).

56. See N. Pennington *et al.*, *Evidence evaluation in complex decision-making*, 51 J. PERSONALITY & SOCIAL PSYCH. 242, 242-58 (1986). See also N. Pennington *et al.*, *Explaining the Evidence: Tests of the Story Model for Juror Decision-Making*, 62 J. PERSONALITY & SOCIAL PSYCH. 189, 189-206 (1992). The Story Model discussed was conceived in 1986.

57. Kassin & Dunn, *supra* note 46, at 270-71.

58. *Id.*

59. *Id.*

60. This note does not examine the facilitative uses of computer-animated displays. The author concedes and agrees that computer animated displays are the most effective way of communicating information to the jury. However, Kassin & Dunn's facilitative hypothesis, when tested, found that when the sequence accurately represented the event in question, judgment accuracy was improved by bringing verdicts more in line with the evidence. For more regarding social science studies and their impact on the courtroom, see the Dual Coding Theory, presented by Mayer and Sim. Their results suggest that multimedia learning occurs when viewers "use information presented in two formats." More simply, a participant's learning is positively affected by presenting verbal narration and illustrations together. A test of this theory in 1999 by Linda C. Morrell found that the above principle is applicable in the courtroom. See Morrell, *supra* note 52. Participants who viewed testimony with computer animation recalled information more accurately and with more detail than those who did not view animations, suggesting that the most effective means of communicating is when CGE is a factor in the presentation. Animation makes cognitive tasks more concrete by supply-

the two studies indicated that animated depictions of a physical event had a greater impact on the jury than equivalent oral testimony, but that the nature of the impact depended on the characteristics of the display.⁶¹ Regarding the prejudicial effect of CGE, the study showed “a sobering distortion in perceptual judgment, as a sizable number of the participants were misled.”⁶²

Unfortunately, Kassin and Dunn believe that the above results could underestimate the potential impact of CGE in two significant ways.⁶³ First, the event used was moderately simple, instinctive to the naïve physicist, and easy to envision.⁶⁴ When the CGE depicts events an average juror does not understand, the effect on the jury could be magnified.⁶⁵ Second, participants watched a brief trial and rendered their decisions immediately afterward.⁶⁶ Vividness effects in oral testimony, however, are typically more pronounced when judgments are delayed rather than instantaneous,⁶⁷ suggesting that the often lengthy time between viewing CGE and deliberations could increase the effect of CGE on jurors.⁶⁸

B. Gestalt Psychology

Gestalt psychology is also useful in understanding how CGE may affect a jury because it focuses on how people organize visual information and elements so that they are perceived as a whole.⁶⁹ The principles of Gestalt psychology, which predict how visual images will be perceived, include area, closeness, proximity, continuation and symmetry.⁷⁰ More specifically, within Gestalt psychol-

ing visual motion to coincide with verbal cues, thereby reducing the processing demands on the listener's short-term memory.

61. See Kassin & Dunn, *supra* note 46, at 279.

62. *Id.* at 270-71. The authors point out, however, that the prejudice prong was only partially supported by the study.

63. *Id.*

64. See Caramazza et al., *supra* note 51.

65. Kassin & Dunn, *supra* note 46, at 278-80.

66. *Id.* at 279.

67. *Id.*; see also Bell, *supra* note 53; Reyes, *supra* note 53.

68. See Kassin & Dunn, *supra* note 46, at 278-79.

69. DONALD E. VINSON, JURY PERSUASION: PSYCHOLOGICAL STRATEGIES & TRIAL TECHNIQUES (1993).

70. *Id.* at 198.

ogy, each of these principles can be manipulated.⁷¹ As to area, the smaller the closed portion of an image, "the more it is apt to look like a complete figure."⁷² Areas with closed boundaries or edges are more likely to be seen as a whole shape.⁷³ Items placed close together are likely to be assembled collectively in the viewer's mind.⁷⁴ Arrangements that have a small number of interruptions in a line will be seen as a complete figure.⁷⁵ Regarding symmetry, the more symmetrical an area, the more likely it will be seen as a complete figure.⁷⁶ By using these principles, a well-designed exhibit could cause jurors to overlook their pre-existing logical understandings and direct their attention to a specific idea, encouraging them to see what counsel wants them to see.⁷⁷

C. Learning Processes

Surveys have shown that humans are essentially visual learners;⁷⁸ 87% of the visual information presented to us is retained, while only 10% of the information we hear is retained.⁷⁹ Studies measuring jurors' information retention shows that jurors were able to recall 65% of the evidence presented three days earlier if the evidence was presented through a combination of oral and visual testimony.⁸⁰ Still other studies show that jurors focus primarily on visual evidence and prefer to use it during trial.⁸¹ CGE has the capacity to exploit this tendency, possibly relaxing the juror's critical

71. *Id.*; see also DUAL-PROCESS THEORIES IN SOCIAL PSYCHOLOGY 15-17 (Shelley Chaiken & Yaacov Trope eds., 1999).

72. See VINSON, *supra* note 69, at 198-99.

73. See *id.*

74. See *id.*

75. See *id.*

76. See *id.*

77. See *id.* ("The utilization of these basic Gestalt principles in the arrangement of the elements in demonstrative evidence can encourage jurors to see the relationships we want them to see.").

78. See VINSON, *supra* note 69, at 185.

79. See R. Dennis Donoghue, *Demonstrative Exhibits: A Key to Effective Jury Presentations*, 369, 371 (PLI Patents, Copyrights, Trademarks, and Literary Property Course Handbook Series No. G4-3892, 1992), also available at WL 349PLI/Pat 369 at *371.

80. See VINSON, *supra* note 69, at 188.

81. See Frederic I. Lederer, *The Road to the Virtual Courtroom? A Consideration of Today's—and Tomorrow's—High-Technology Courtrooms*, 50 S.C. L. REV. 799, 814 (1999).

nature.⁸² Jurors may be misled by animated displays that are entertaining but are physically and factually far-fetched.⁸³

One study, for example, showed jurors a computer animation depicting the trajectory of a body going off a building and asked whether the person slipped and fell, and was therefore negligent, or jumped, thus committing suicide.⁸⁴ Jurors were more likely to find negligence if the animation depicted the body falling straight down the building even though the oral testimony clearly stated that the body landed twenty to twenty five feet from the building. The animation caused jurors to ignore both the reported verbal physical evidence and the common sense understanding that things fall straight down.⁸⁵ Thus, the danger a jury will be misled requires strict scrutiny as to the accuracy of the displayed information.

Another expert in the field of visual persuasion, Mario Borelli, hypothesizes that society's familiarity with the animated medium itself could lead a jury to accept information displayed in this format as the truth, even if it is not. To quote Borelli, "The fear is that the highly communicative nature of computer graphics and the myth of the infallible computer will take the decision out of the jury's hands."⁸⁶ The old adage 'seeing is believing' may gain extra force in this setting."⁸⁷ Because television is the main medium today for gaining information, when evidence is presented in an animated format that we have become accustomed to viewing, it can become "not only believable, but virtually unassailable."⁸⁸

Another expert, Brian Stonehill, concurs with this rationale stating, "Computer animation works on a visceral level that quite

82. See Michael Owen Miller & Thomas A. Mauet, *The Psychology of Jury Persuasion*, 22 AM. J. TRIAL ADVOC. 549, 563 (1999) (describing how the animation [in question] caused jurors to ignore the reported physical evidence (as well as a common sense understanding that things fall straight down)); see also Martha M. Jenkins, *Computer-Generated Evidence Specifically Prepared for Use at Trial*, 52 CHICAGO-KENT L. REV. 600 (1976).

83. See Miller & Mauet, *supra* note 82, at 563.

84. Kassin & Dunn, *supra* note 46, at 276.

85. *Id.* at 279.

86. Borelli, *supra* note 1, at 455.

87. *Id.*

88. Craig Murphy, Comment, *Computer Simulations and Video Re-Enactments: Fact, Fantasy and Admission Standards*, 17 OHIO N.U. L. REV. 145, 146 (1990).

easily bypasses skeptical, rational faculties⁸⁹. . .[Computer animation] creates psuedo-memories of the event [and the] memorability of having witnessed the crime itself, but [with] no validity in fact.”⁹⁰ Thus, viewing an animated depiction could invite a verdict based upon emotion rather than pure objective fact.⁹¹

Opponents of the sensory simulation theory put forth the Dual Process (“DP”) theory.⁹² DP Models approach the question of how people *know* by viewing information processing as occurring along a continuum.⁹³ DP theorists recognize that people may not view evidence with fresh eyes and an open mind.⁹⁴ Instead, jurors may rely on prior knowledge, stereotypes, and expectations in examining and weighing the validity of the CGE.⁹⁵ However, DP contends there are limits to “automatic processing.”⁹⁶ People can expend vast amounts of time and mental energy to assemble decisions, beliefs, and a sense of knowing.⁹⁷ This more “mindful” strategy⁹⁸ requires cognitive effort and a will to scrutinize and reflect on the

89. Claire Cooper, *Computer Animation on Trial*, The San Diego Union Tribune, Jan. 27, 1993, at E1.

90. *Id.* The author would like to point out that this fact is only exacerbated when only one party uses computer-animated displays.

91. See John Selback, Comment, *Digital Litigation: The Prejudicial Effects of Computer-Generated Animation in the Courtroom*, 9 HIGH TECH. L.J. 337 (1994) (“This [unfair prejudice] would certainly apply to evidence which is more convincing merely because it appeals to jurors on a visceral level. A decision based on visceral impact is arguably just as bad as a decision based on emotion.”).

92. Chaiken & Trope, *supra* note 71.

93. *Id.* at 13.

94. *Id.* at 29.

95. *Id.* at 13.

96. *Id.* at 29. Automatic processing is a term used to “indicate that perceivers are so adept at effortless processing that much of their social life proceeds automatically.” In 1989, Devine concluded through his research that stereotypes are automatically activated, and that only through conscious exertion of the will can people overturn such thoughts and be unprejudiced. In 1990, Gilbert, Krull and Malone stated that people automatically believe any assertion put to them, and only subsequently, consider its truth or falsity through conscious exertion of the will.

97. Chaiken & Trope, *supra* note 71, at 13.

98. *Id.* Mindful strategy is “a bottom-up process that requires the exertion of cognitive effort to reflect on and examine the stimulus.”

stimulus.⁹⁹ Thus, CGE stimuli may require jurors to go beyond their “default processing.”¹⁰⁰

There are three factors that can cause people to question their judgments and motivate them to take a “closer look.”¹⁰¹ First, when feeling uncertain, jurors will be forced to proceed systematically.¹⁰² That is, when uncertain about their default judgment, jurors will exert the cognitive effort necessary to revise their beliefs.¹⁰³ Thus, if CGE is so unrealistic that jurors are skeptical, they will become critical of the display.¹⁰⁴ Cognitive effort will overturn the initial “automatic” response to the CGE, and jurors will take a closer look.¹⁰⁵

Second, when the information is inconsistent with prior beliefs and expectations, jurors will examine CGE more closely.¹⁰⁶ When the perspective of jurors is contested, the jurors’ confidence in the judgments arrived at through least-effort processing will be challenged.¹⁰⁷ Thus, if the CGE is factually improbable or at odds with juror expectations, they are more likely to examine the display critically.

Third, people may simply choose to take a closer look.¹⁰⁸ People can be flexible processors and more elaborate processing can be employed when people want to be more certain of their judgments.¹⁰⁹ Jurors may want CGE to be highly accurate. If it is not, jurors may dismiss it as unreliable.¹¹⁰

99. *Id.*

100. *Id.* Default processing can be defined as “where people act in a somewhat mindless fashion, arriving at their sense of knowing through a top down process whereby a preconception is imposed on new information. Both default processing and mindful strategy are two “distinctive paths to arrive at knowledge – paths that individuals have the cognitive flexibility to choose between.”

101. *Id.* at 29. Bruner coined the term “closer look” in 1957. He used this term to define the means through which initial automatic responses could later be overturned with cognitive effort. *Id.*

102. *Id.* at 25.

103. Chaiken & Trope, *supra* note 71, at 25.

104. *Id.* at 33.

105. *See id.* at 29.

106. *Id.*

107. *Id.*

108. *Id.*

109. Chaiken & Trope, *supra* note 71, at 29.

110. *Id.*

Finally, opponents of the sensory simulation theory also suggest that because jurors are so familiar with special effects from movies and television, they are very unlikely to say "I saw it on a screen, so it must be true, and now I am incapable of even considering a contrary scenario."¹¹¹ Because jurors know that many of the images displayed in a movie or television program are not real, they understand that visual images could be manipulated at trial to distort what actually happened.¹¹² The "I saw it on TV so it must be true" mentality may be even more unlikely when jurors enter the courtroom and realize they must decide a real case.¹¹³ Thus, DP theorists believe the concern about the unduly prejudicial effect of CGE is unwarranted. We should respect the ability of jurors to process information objectively and make up their own minds.¹¹⁴

D. Loopholes in the Production Process

Even assuming jurors will exercise good judgment and use common sense, they still may be misled.¹¹⁵ Critics argue that the animation production process may subtly distort reality.¹¹⁶ These critics assert that everyone involved in the production of an animation - the animator, attorney, expert witness, and the party - has a vested interest in the outcome of the case.¹¹⁷ The individuals who offer the CGE into evidence are the same people who design, create, and edit the evidence.¹¹⁸ Moreover, the animator often subse-

111. See Galves, *supra* note 11, at 218-19. See also Ralph Adam Fine, *Feature: Object at Your Risk*, 58 OR. ST. B. BULL. 19, 19 (1998) ("Jurors want to do what is right; they are looking for the 'truth' of the dispute - what really happened. According to a 1992 Brookings Institution report, 'Jurors take their responsibilities very seriously and attempt to reach fair and just results.'").

112. See Galves, *supra* note 11, at 219.

113. See *id.* at 218-19.

114. See *id.* at 219.

115. See Lederer, *supra* note 81, at 817 ("To the best of our knowledge, this [improper manipulation] is technically possible. . . Given sufficient funds and time, we believe that the technology exists to permit at least a reasonable possibility of altered or totally fabricated electronic evidence").

116. See Jane B. Baird, *New From the Computer: "Cartoons" for the Courtroom*, N.Y. TIMES, Sept. 6, 1992, at C5.

117. See Ellenbogen, *supra* note 43, at 1099-1100; see also *Science and Technology Week: Videos are Dangerous to Justice* (CNN television broadcast, Feb. 29, 1992); Rorie Sherman, *Moving Graphics - Computer Animation Enters Criminal Cases*, Nat'l L.J. Apr. 6, 1992, at 1, 32.

118. See Ellenbogen, *supra* note 43, at 1099; see also Sherman, *supra* note 117, at 32.

quently serves as an expert witness and is unlikely to objectively critique his own work.¹¹⁹ Accordingly, there is an opportunity and a strong incentive for these interested parties to prepare CGE in a biased fashion.¹²⁰

One author has even suggested that extraneous information in the animation can contain subliminal messages; for example, that a litigant is at fault or simply is an evil person.¹²¹ Finally, current software may not be adequate to support the programs employed by CGE. It has been suggested “[that] the software is sometimes not sophisticated enough for the accurate depiction of the inputted technical data.”¹²² Assuming the above arguments have merit, cross-examination may not effectively challenge the reliability of CGE.¹²³ Would it be the vivid visual display or the verbal cross-examination of the display’s codes and logarithms that would have a lasting effect on the jury? It will likely be the former.

It also has been suggested that the animation process itself warps images “simply by its production technique.”¹²⁴ Judge Van Graafeiland voiced this view in *Perma Research and Development v. Singer*,¹²⁵ stating that the potential for tampering with the CGE “presents a real danger of being the vehicle for introducing erroneous, misleading or unreliable evidence.”¹²⁶ Judge Van Graafeiland thought it possible that animators themselves might “introduce speculation” by injecting creativity into a continuous display¹²⁷ or making (possibly flawed) personal assumptions about the evidence displayed.¹²⁸

119. See Ellenbogen, *supra* note 43, at 1099; see also Sherman, *supra* note 117, at 32.

120. See Ellenbogen, *supra* note 43, at 1099.

121. See Ellenbogen, *supra* note 43, at 1101 n.170.

122. See Berkoff, *supra* note 15, at 852. See also Paul Marcotte, *Animated Evidence*, A.B.A. J., Dec. 1989, at 52, 55.

123. See Sharon Panian, Comment, *Truth, Lies, and Videotape: Are Current Federal Rules of Evidence Adequate?*, 21 SW. U. L. REV. 1199, 1212 (1992) (quoting Eli Chernow, *From the Bench: Video the Courtroom – More Than a Talking Head*, LITIG., Fall 1988, at 4).

124. See Ellenbogen, *supra* note 43, at 1100 n.161.

125. *Perma Research & Dev. v. Singer Co.*, 542 F.2d 111 (2d Cir. 1976) (Van Graafeiland J., dissenting) (1976). Although this case dealt with computer simulations, Judge Van Graafeiland’s concerns apply to animations with just as much force.

126. *Perma Research*, 542 F.2d at 125 (2d Cir. 1976) (quoting Jerome J. Roberts, *A Practitioner’s Primer of Computer-Generated Evidence*, 41 U.CHI. L. REV. 254, 255-56 (1974)).

127. See Ellenbogen, *supra* note 43, at 1099.

128. See *id.* at 1099-1100.

Human error may also distort animations because it is an individual who actually enters the information into the computer.¹²⁹ As one accident-reconstruction expert explains, “an animation artist can make a car fly. . .there are some so-called experts out there who may be 50 percent or more off. Animation is only as good as the information put into it.”¹³⁰ In sum, the production process itself may cause additional error and prejudice.¹³¹ This danger is magnified by the difficulty of discovering process errors, coupled with, as stated earlier, the tendency of humans to “see what they believe.”¹³²

E. Persuasive techniques used in other fields employing animation

Additional techniques may subtly enhance an animation’s persuasiveness.¹³³ For example, studies have shown that regular use of color is a factor in the recognition of an object.¹³⁴ High contrast colors are more likely to attract a juror’s attention; certain combinations of colors can reduce the impact of the message or convey the wrong message.¹³⁵ Color-coding can enhance comprehensibility and recall for the jury.¹³⁶ Failure to present appropriately colored evidence effectively can disadvantage a party because the jury may recall the opponent’s superior animation more clearly.¹³⁷ The im-

129. See *id.* at 1099 (quoting Rorie Sherman, *Moving Graphics – Computer Animation Enters Criminal Cases*, NAT’L L.J., Apr. 6, 1992, at 1).

130. Marcotte, *supra* note 122, at 52, 56 (quoting Arthur Damask, a physicist at Queens College in New York).

131. See Ellenbogen, *supra* note 43, at 1099-1102. Forensic Technologies International, one of the largest creators of CGE, has even expressed this sentiment. They have stated that the computer animators’ evidence will make errors that can significantly affect the outcome of cases.

132. See Borelli, *supra* note 1, at 455; see also Ellenbogen, *supra* note 43; Roger Parloff, *Now Showing in a Courtroom Near You*, AM. LAW, May 1990, at 4, 10, 12.

133. See Galves, *supra* note 11, at 299. See also Weinreb, *supra* note 13, at 418.

134. See Aura Hanna & Roger Remington, *The Representation of Color and Form in Long-Term Memory*, 24 MEMORY & COGNITION 322-330 (1996) (finding that when test subjects were shown items in color first and then the same objects in black and white, the colored items were easier to recall); see also Cope Thomas, *Computer Generated Animation: Identifying New and Subtle Prejudicial Special Effects*, 74 FLA. B.J., Dec. 2000, at 52, 53.

135. VINSON, *supra* note 69, at 199.

136. *Id.*

137. See Thomas, *supra* note 134, at 52-53.

pact color has on the eye and mind, coupled with the possible biased intentions of the CGE producer, may cause inequity.¹³⁸

Repetition is another factor that CGE can exploit.¹³⁹ Advertising research shows that repetition improves memory, augments viewer assurance, and encourages the viewer to respond favorably to the communication.¹⁴⁰ The same principles apply to CGE. Running the CGE for an optimal length of time and repeating the same event multiple times should enhance memory.¹⁴¹ The cumulative effect of the repeated portrayal may magnify the prejudicial effect of the CGE without improving its message, which should be the sole objective of CGE.¹⁴²

Visual metaphors¹⁴³ also may be unfairly prejudicial.¹⁴⁴ One author explained the danger by detailing the visual metaphor used by a chemical treatment plant defending an action for alleged water contamination:

First, the animation extracted a three-dimensional rectangular portion of the contaminated soil, measuring 10 feet long and 50 feet wide. This portion was then twisted as one would "wring out" water from a wet towel. Groundwater from the soil was represented in the form of large water drops falling into a tunnel and then into three train tank cars, for a total of 25,000 gallons. From the tanks, the contaminated groundwater was drained into another funnel and into a long tube with a flame under it. Here, the groundwater was distilled and the contaminant was extracted. The extracted groundwater then fell into a small cup held by a person. In short, the process started

138. See Weinreb, *supra* note 13, at 418-19.

139. See Thomas, *supra* note 134, at 53.

140. See Surendra N. Singh & Linville Ajay Sukdial, *Enhancing the Efficacy of Split Thirty-Second Television Commercials: An Encoding Variability Application*, 24 J. ADVERTISING 24 (1995).

141. See Thomas, *supra* note 134, at 53.

142. See *id.* But see Florida v. Pierce, 671 So.2d 186, 191 (1996) (no undue emphasis placed upon an animation which was shown to the jury for a total of six minutes in the course of an 11 day trial).

143. See Thomas, *supra* note 134, at 53-54.

144. PAUL MESSARIS, VISUAL PERSUASION: THE ROLE OF IMAGES IN ADVERTISING 7 (1997).

with 25,000 gallons of groundwater and ended with a half-cup of contaminant.¹⁴⁵

This animation may cause unfair prejudice in two ways. First, by using tanks and measuring cups as visual metaphors, the jury may infer that given the large amount of groundwater, only a very small amount of contaminant, one small measuring cup full, was spilled.¹⁴⁶ This small quantity, however, could in fact be a "lethal amount."¹⁴⁷ Second, the proportional image of groundwater compared to contaminant may give rise to an emotional response from the viewer.¹⁴⁸ The viewer might be astounded that only a half-cup of contaminant remained after the waste disposal practices of the plant. Alternately, the jury may resent the plaintiff for bringing an action based on only a half-cup of contaminant.¹⁴⁹ Either response might inflame the jury, causing a verdict based on sentiment rather than a weighing of material facts.¹⁵⁰

In addition, allowing an animation to "violate reality" can have a similar misleading effect. Violating reality can be done in two distinct ways.¹⁵¹ First, animations can "fly" the jury through the portrayed events with different camera angles. For example, the jury can travel just behind and above the speeding truck, or in the driver's seat, or may have a ground level or even an underground view.¹⁵² Second, the animation can be seen on a split screen, showing two different views at once. For example, in one portion of the screen, the viewer can see an airplane taking off. In another portion, the jury can see the mannequin pilot pulling back on the control stick, while viewing the interior mechanical workings of the aircraft. Also, visual obstructions can fade in and out, revealing the inner workings of the airplane.¹⁵³ Despite the great detail and range provided by these displays, each of the visual manipulations described above supplies jurors with *only* an approximation of how

145. Thomas, *supra* note 134, at 53-54.

146. *Id.* at 54.

147. *Id.*

148. *Id.*

149. *Id.*

150. *Id.*

151. See Thomas, *supra* note 134, at 54.

152. See *id.*

153. See *id.*

the event occurred.¹⁵⁴ The animation is only an “artfully planned and staged presentation promoting one party’s unproven theory.”¹⁵⁵ These visual displays may cause “technology shock,”¹⁵⁶ which results in an unforgettable and more favorable viewing experience.¹⁵⁷

IV. TOWARD BETTER REGULATION OF CGE

A. *Guidelines for the Use of CGE*

Given all of the potential dangers described above, a court must be very careful in making the admission decision. I propose the following simple and practical substantive and procedural guidelines for a judge to follow.

Gestalt principles are useful when deciding whether the CGE accurately depicts the event in question. Since area, closedness, continuation and symmetry¹⁵⁸ all may make a part of a picture look like the whole when improperly manipulated, the court must consider these elements carefully. The animation, as well as any visual metaphors contained in the display, should only be admitted upon a showing of authenticity and accuracy. This can be accomplished in two ways: 1) the jury could be told the actual dimensions as they watch the display and again, prior to deliberations; and 2) the actual measurements can be depicted on the animated display itself. Multiple verbal and visual reminders of the true dimensions make it less likely that the jurors will disregard reality.

In addition, proximity in the CGE¹⁵⁹ and the use of visual metaphors¹⁶⁰ in the animation should note the distance being depicted. By combining words with narrative visual display,¹⁶¹ the jury will not be able to disregard the actual measurements, which the

154. *See id.*

155. O’Flaherty, *supra* note 2.

156. Thomas, *supra* note 134, at 54. “Technology Shock” is described as a situation where the juror pays greater attention as the brain deals with the new medium.

157. *See* MESSARIS, *supra* note 144, citing R.N. SHEPARD, *MIND SIGHTS: ORIGINAL VISUAL ILLUSIONS, AMBIGUITIES, AND OTHER ANOMALIES* (1990).

158. VINSON, *supra* note 69, at 198-99.

159. VINSON, *supra* note 69, at 198-99.

160. *See* Thomas, *supra* note 134, at 53.

161. VINSON, *supra* note 69. The most effective form of communication is by verbal and visual testimony combined.

CGE may distort. With the actual numbers stated, the jury may overcome its tendency to believe what it sees¹⁶² if the numbers simply do not make the event plausible.

A judge must also be wary of the use of color. Although the use of color is not *per se* prejudicial,¹⁶³ it is clear that color assists a jury in recalling the animation over other evidence.¹⁶⁴ The courtroom should be a level playing field. Thus, a judge should allow color only when it is necessary and probative. Examples of an appropriate use of color could include depicting night and day or the color of cars in an automobile accident.¹⁶⁵ Color should be used to mimic the actual scene it depicts and no more. To combat the danger that color may cause the jury to give the animation excess weight, the judge should instruct the jury that all evidence should be given the same weight and represents only one party's view of the disputed event. Such an instruction will re-emphasize to the jury the legal and equitable importance of considering all evidence in the record, not only that which is easier to recall.

Repetition in CGE also warrants judicial scrutiny. As noted above, repetition makes television commercials more effective. Several repetitions of a commercial tend to assure the consumer that the seller believes in the product and is willing to stand by it.¹⁶⁶ Moreover, television commercials that run for two 15-second lengths are more effective than one 30 second segment.¹⁶⁷ Judges should not allow counsel to repeat the same animation over and over.¹⁶⁸ Judges should also limit stop-action, which allows the proponent to emphasize favorable segments of the animation while de-

162. See O'Flaherty, *supra* note 2.

163. See Thomas, *supra* note 134, at 53.

164. JJ Goodell, *Some Thoughts on Color*, (Apr. 5, 2003), available at <http://www.goodellgroup.com/color.html>. In the advertising context, "It is known that the color red inspires impulsive buying. Our eyes are drawn to the color like ducks to water. Just walk into any supermarket and look at the color most often used on products. It's red. The next one is yellow. Both colors tend to raise your blood pressure just a tad and dilate your pupils. They cause excitement, which goes to prove one thing: color affects us." If this happens to ordinary people as they food shop, by analogy, the same impetus is at work in the courtroom.

165. See Thomas, *supra* note 134, at 53.

166. See Singh & Sukdial, *supra* note 140.

167. See *id.*

168. See Berkoff, *supra* note 15, at 850-52.

emphasizing unfavorable portions.¹⁶⁹ By allowing repeated rewind and fast-forward, the time frame of the event may be distorted by lengthening or shortening the elapsed time.¹⁷⁰ Judicial discretion, not counsel's strategy, should dictate the number of times the display should run.

B. *The Maryland Experience*

In 1998, the Maryland Court of Appeals adopted model rules proposed by the state's Standing Committee on Rules of Practice and Procedure.¹⁷¹ The model rules addressed, *inter alia*, the standards and procedure for admitting CGE.¹⁷² The Committee concluded that the existing rules of evidence were sufficiently flexible to provide adequate control of the admissibility of computer generated displays; however, they also adopted new procedural rules to afford courts the most effective and least prejudicial method of implementing computer technology in the courtroom.¹⁷³ Quite aptly, the Maryland Committee limited the definition of CGE to include

169. *See id.*

170. *See id.*

171. This court is the Maryland State Court of Appeals. M.D. CONST. Art. IV, § 18. (The Court of Appeals is empowered to regulate the practice and procedure in, and the judicial administration of, the courts of this State). Under Courts and Judicial Proceedings Article § 13-301, the Court of Appeals may appoint a standing committee of lawyers, judges, and other persons competent in judicial practice, procedure, or administration to assist the Court in the exercise of its rulemaking power. The Standing Committee on Rules of Practice and Procedure, often referred to simply as the Rules Committee, was appointed originally in 1946 to succeed an ad hoc Committee on Rules of Practice and Procedure created in 1940. Its members meet regularly to consider proposed amendments and additions to the Maryland Rules of Procedure and submit recommendations for change to the Court of Appeals. Maryland's approach is worth noting because it proposed the most detailed and substantial changes. For more information, *see generally* Standing Committee on Rules of Practice and Procedure, available at <http://www.courts.state.md.us/rules> (last modified Mar. 7, 2002).

172. The Maryland committee proposed other rules that are not discussed throughout this paper. The committee provided interesting proposals on the consideration of what rule should apply to exhibits that are taken to the jury room. For a thorough explanation of all the rules debated by the Maryland committee, see Carbine & McLain, *supra* note 10; *see also* MD. RULE 2-504.3, adopted on Feb. 10, 1998. Moreover, the committee declared that the rules discussed throughout this section of the note are not applicable to criminal defendants. The inapplicability was related to the defendant's right to a speedy trial, the lower emphasis on discovery in criminal proceedings as compared to civil proceedings, and the possible unconstitutionality mandating disclosure from an accused.

173. Carbine & McLain, *supra* note 10, at 46-47.

“forms of computer-generated evidence known as computer animations and computer simulations, as well as photographs produced by non-conventional digital cameras.”¹⁷⁴ This limitation was wise; there is no need for a broad, over-inclusive definition that would encompass other forms of evidence the courts have handled more easily.¹⁷⁵

The Maryland rules provide for pretrial notice of CGE so that objections may be made and ruled upon before trial.¹⁷⁶ If there is no applicable scheduling order in the given court, notice must be received at least 90 days prior to trial.¹⁷⁷ Disclosure is not required if the CGE is to be used solely for argument purposes; however, whether the graphic can be used in the opening statement or for rebuttal is left entirely to judicial discretion.¹⁷⁸

The right to discovery of CGE is automatic once notice is given.¹⁷⁹ The opponent has 60 days to object to the validity and reliability of the CGE.¹⁸⁰ Once an objection is filed, the court must hold a hearing to rule on the objection.¹⁸¹ Assuming compliance with applicable rules, the item will be admitted, and the weight given to it will be determined by the jury.¹⁸² This rule eliminates the need for a pretrial hearing to examine the credibility of the underlying information.¹⁸³ Using the 60-day window provided, the CGE opponent need not await a mid-trial ruling. If flaws in the CGE are identified, the court may exclude the evidence altogether, excise the offending portions, or provide the proponent of the CGE an opportunity to cure the incorrect elements of the display before trial.¹⁸⁴ The rules also put the burden on the proponent of the evidence to preserve it for the record, as the fact-finder viewed it.¹⁸⁵

174. *Id.* at 28.

175. *Id.*

176. *Id.* at 7.

177. *Id.* at 36-37.

178. *Id.* at 37.

179. Carbine & McLain., *supra* note 10, at 37.

180. *Id.* at 38.

181. *Id.* at 47.

182. *Id.* at 40.

183. *Id.* at 39-40.

184. *Id.* at 35.

185. Carbine & McLain, *supra* note 10, at 35.

If an expert is needed to challenge the validity of the CGE, and the opponent of the CGE cannot afford to employ one, the court may appoint an expert and allocate the costs to the parties as it sees fit.¹⁸⁶ This rule is necessary because animations and experts are expensive, which may cause parties to forgo using CGE.¹⁸⁷ Litigants with limited budgets may feel compelled to settle when faced with opponents who are able to afford animated displays.¹⁸⁸ Maryland sought to level the legal playing field.¹⁸⁹

The Maryland Committee chose not to require particular jury instructions.¹⁹⁰ The Committee did, however, suggest some limited instruction:¹⁹¹

1. Limited Purpose

You [are about to see] a computer [animation] that is being offered by the [party]. This [animation] is being admitted only for the limited purpose of [illustrating [witness's] testimony] [illustrating [the party's] theory of the case] [showing results of experiments or tests conducted by or on behalf of [the party]] [showing the basis of [an expert witness' opinion]]. The computer [animation] is not itself evidence.

2. Weight

[Regarding assumptions], in evaluating what weight, if any, to give to the testimony that relies on the computer [animation], bear in mind [the principal assumptions underlying the exhibit, e.g., that it is predicated on [the party's] version of the facts; that the facts are in dispute; that the exhibit is no better than the assumptions on which it rests]. It is for you to decide whether those assumptions are warranted.

[Regarding known inaccuracies], bear in mind also [any noteworthy differences between the exhibit and the facts at issue – for example, that the exhibit does not pur-

186. *Id.* at 35.

187. O'Flaherty, *supra* note 2.

188. See Selback, *supra* note 91, at 361.

189. See Selback, *supra* note 91, at 361 ("A party opting to present a traditional case will often be prejudiced by the use of computer-generated evidence by the other side.").

190. Carbine & McLain, *supra* note 10, at 26-27.

191. *Id.* at 26-27. It should be noted that the Maryland Standing Committee included simulations as well as animations in the jury instruction proposal.

port to be drawn to scale or include all (or certain specific) variables.

I have several additional suggestions. Although Maryland chose not to adopt the jury instruction, I propose that the limited instruction should be given before the trial begins and prior to deliberations if the CGE is admitted into evidence. I would also add to the instruction that the exhibit has designated actual distances and measurements that should be considered with as much weight as the animation itself.

Instructions of this sort would focus the jurors on the issue at hand and not on the medium through which the evidence is presented. Although it is difficult to make this distinction, the instructions will ensure that the jurors are aware of the potential for CGE to mislead. The instruction, at a minimum, will remind the jury of their duty as fact-finders to weigh carefully all of the proffered evidence.

Finally, requiring judges, counsel and law students to become familiar with the uses, applications, and potential dangers of animated displays will help make animations more effective and less prejudicial.¹⁹² To accomplish this goal, judges should attend seminars on the use of computer technology in the courtroom. Law students should be encouraged, if not required, to take a class on technology, persuasion and the law.¹⁹³ The knowledge they acquire will increase their capacity to present their clients' cases forcefully and effectively.

192. See Galves, *supra* note 11, at 274-86.

193. Classes such as these are found at New York Law School in the form of electives. A student can take such classes as Visual Persuasion or Law, Technology & Democracy. William & Mary School of Law has taken one step further, requiring all students to take a class on technology and its function in the court during their third year of law school. "Beginning with the class of 1999, the William and Mary School of Law added a mandatory courtroom technical training to the legal skills curriculum, effectively making it a graduation requirement." See Weinreb, *supra* note 13, 424 n.186 (quoting Frederic I. Lederer).

V. CONCLUSION – PREPARING FOR THE FUTURE

The use of CGE is bound to increase in the near future.¹⁹⁴ The judiciary has successfully integrated new technologies¹⁹⁵ in the past, such as photography, lie detectors, and DNA evidence. With further research on CGE¹⁹⁶ and appropriate rules and guidelines, there is no reason why CGE cannot become an integral and effective tool for presenting evidence in the courtroom.

The ability to incorporate special effects into animated displays poses dangers. The technology is subtle¹⁹⁷ and constantly improving.¹⁹⁸ Moreover, deceptive computer tactics are not well understood by the legal community.¹⁹⁹ Thus, any new rule should account for the sophistication of the animation production process as well as the susceptibility of jurors to manipulation. By applying social science principles, technology can be controlled and harnessed to assist in the pursuit of justice.²⁰⁰

194. See Berkoff, *supra* note 15, at 855 (“As a tool . . . computer simulations have revolutionized much of today’s tort litigation. They are here to stay, and those persons associated with computer simulations must take the necessary steps to solve the many problems surrounding them.”). Moreover, even newer technology such as holograms will present many more complex problems. Thus, it is imperative for us to evenhandedly apply an evidentiary foundation that can be flexible enough to incorporate new technological change and growth.

195. See *Judicial Conference Nixes Cameras in the Courtroom*, 67 DEF. COUNS. J. 429, 429 (2000) (quoting Chief Judge Becker) (“The federal courts have shown strong leadership in the continuing effort to modernize the litigation process. This has been particularly true of the federal judiciary’s willingness to embrace new technologies, such as electronic case filing and access, videoconferencing and electronic evidence presentation systems.”).

196. See Feigenson & Dunn, *supra* note 5.

197. See Thomas, *supra* note 134, at 54.

198. *Id.*

199. *Id.*

200. See Weinreb, *supra* note 13, at 447 (“[W]ith checking technology in place and proper principles in mind, judges and juries will be able to establish outer limits over their control and ensure that society continues to receive true justice.”).

